

Q-particles in embedded declaratives, mood, and clausal complementation*

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Abstract Q-particles are functional items that are used to form alternative-related constructions. This paper investigates a hitherto understudied use of the Japanese Q-particle *ka* in which it occurs immediately below the declarative complementizer and imposes constraints on the doxastic state of the attitude holder. I show that this use of *ka* is licensed only under a limited range of attitude predicates, and once licensed, it encodes the presupposition that the attitude holder is ‘uncertain’ regarding the truth value of the proposition denoted by the embedded sentence.

Keywords: Q-particles, mood, attitude predicates, epistemic modals, Japanese

1 Introduction

Q-particles are functional items that are used to form various ‘alternative-related’ constructions, such as questions, disjunctives, indefinites, etc. (Hagstrom 1998; Cable 2007, 2010; Szabolcsi 2015; Uegaki 2018; a.o.). Q-particles are attested cross-linguistically, with variation among languages as to the range of constructions they may occur in. As has been observed in the literature, the Japanese Q-particle ‘*ka*’ appears in many relevant constructions, as shown in (1)-(4).

- | | | | |
|-----|---|-----|---|
| (1) | Jo-wa kimasita ka ?
Jo-TOP came.POL Q
‘Did Jo come?’ (<i>Polar Q</i>) | (2) | [Dare-ga kita ka] osiete.
who-NOM came Q tell
‘Tell me who came.’ (<i>Wh-Q</i>) |
| (3) | [Jo ka Bo]-ga kita.
Jo Q Bo-NOM came
‘Jo or Bo came.’ (<i>Disjunctive</i>) | (4) | [Dare- ka]-ga kita.
who-Q-NOM came
‘Someone came.’ (<i>Indefinite</i>) |

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This paper discusses an aspect of the Japanese Q-particle which is distinct from those extensively studied cases. Consider (5). Here the sentences involve a declarative sentence embedded under the predicate ‘*kitaisuru* (hope)’. As (5b) shows, *ka* may appear immediately below the declarative complementizer ‘*to*’.

- (5) a. Jo-wa [zibun-ga erabareru to] **kitaisiteiru**.
 Jo-TOP self-NOM is.elected C **hope**
 ‘Jo hopes that she will be elected.’
- b. Jo-wa [zibun-ga erabareru **ka** to] **kitaisiteiru**.
 Jo-TOP self-NOM is.elected Q C **hope**
 (lit.) ‘Jo hopes that IF she will be elected.’

This apparently optional occurrence of *ka* adds the implication that the commitment of the attitude holder toward the proposition denoted by the embedded sentence is ‘weaker’ than that conveyed by the *ka*-less counterpart in (5a). I call these occurrences of *ka* ‘**modally functioning Q-particles (MFQs)**’, as they seem to impose constraints on the attitude holder’s doxastic state. I also posit ‘ ka_{MFQ} ’ as the entry that encodes the relevant semantic function. For convenience, I express the intuition behind ka_{MFQ} by placing ‘IF’ after the complementizer ‘*that*’ in translations, as if this were the English counterpart of this item.

This paper aims to explicate the nature of ka_{MFQ} , providing a precise description of its distribution and semantic contribution. In Section 2, I investigate which attitude predicates license ka_{MFQ} . In Section 3, I propose a formal analysis that captures the distribution of ka_{MFQ} and the semantic difference associated with the presence or absence of ka_{MFQ} . In Section 4, I discuss how ka_{MFQ} interacts with embedded epistemic modals. In Section 5, I conclude.

2 The distribution of ka_{MFQ}

This section investigates which attitudes are able to license ka_{MFQ} . Section 2.1 introduces the classification of attitudes proposed in Anand & Hacquard (2013). Section 2.2 shows that ka_{MFQ} is only licensed by a certain class of attitude predicates within the classification by Anand and Hacquard. Section 2.3 shows how ka_{MFQ} is differentiated from apparently similar cases of *ka* observed in the literature.

2.1 Classifying attitudes

Generally speaking, the modal context of an embedded clause depends on the semantics of the embedding predicate. This has often been discussed with respect to the distribution of indicative and subjunctive moods in Romance languages (Farkas

1985, 1992; Portner 1997, 2018; Giannakidou 1998; Villalta 2009; a.o.), and the compatibility with embedded epistemic modals (Anand & Hacquard 2013; Ippolito 2018). Anand & Hacquard (2013) propose to explain the relevant phenomena based on two semantic properties of attitudes: **representationality** and **preference-basedness**.¹ Representational attitudes convey a ‘mental picture’ (Bolinger 1968), describing the content of a propositionally consistent attitudinal state. Preference-based attitudes convey an ordering among alternatives, just as ‘*want* ϕ ’ is analyzed as asserting that ϕ is preferred over $\neg\phi$ (see Heim 1992).

Assuming that there are no attitudes that are both non-representational and non-preference-based, attitudes are classified into the following three classes. The first subsumes attitudes that are representational and non-preference-based. This class, which Anand and Hacquard call ‘attitudes of acceptance’ (Stalnaker 1984), involves ‘*know*’, ‘*believe*’, ‘*report*’, ‘*realize*’, etc.² As they argue, these attitudes are typically indicative-governors, and allow epistemic modals to appear under them, whether possibility or necessity ones. (6) shows that English *believe* allows both possibility and necessity modals. (7) (= Anand & Hacquard 2013: 15) shows that French *realize* allows an epistemic modal and this modal shows indicative mood inflection.

- (6) John believes that Paul {might / must} have killed her.
- (7) Jean a **réalisé** que Marie **devait** avoir connu son tueur.
 Jean **has realized** that Marie **must**.IND.IMPF have known her killer
 ‘Jean realized that Marie must have known her killer.’

The second class subsumes attitudes that are non-representational and preference-based. This involves desideratives (e.g., ‘*want*’, ‘*wish*’), and directives (e.g., ‘*order*’, ‘*demand*’). Anand and Hacquard observe that these attitudes are typically subjunctive-governors, and disallow epistemic modals, whether possibility or necessity ones. (8) (= Anand & Hacquard 2013: 17) shows that French *demand* disallows epistemic modals (notice that the modal would select for subjunctive mood).

1 Here I use the term ‘attitudes’ somewhat generally, referring to both abstract mental states and linguistic expressions that denote such mental states (i.e., attitude predicates).

2 Stalnaker (1984) provides the following description for this term (pp.79-80): ‘Acceptance, as I shall use this term, is a broader concept than belief; it is a generic propositional attitude concept with such notions as presupposing, presuming, postulating, positing, assuming and supposing as well as believing falling under it. ... As a rough criterion, one may say that a propositional attitude concept is an acceptance concept if the attitude is said to be *correct* whenever the proposition is true. Belief is an acceptance concept because a correct belief is a true belief.’ In their account, Anand and Hacquard expand the coverage of this category by including fiction predicates like ‘*dream*’ or ‘*imagine*’. These predicates are not attitudes of acceptance in Stalnaker’s definition but they are in Anand and Hacquard’s characterization, as they provide a consistent propositional content but do not involve a preferential content. This paper follows the characterization by Anand and Hacquard.

	Non-preference-based	Preference-based
Representational	Attitudes of acceptance	Emotive doxastics / Dubitatives
Non-representational	—	Directives / Desideratives

Table 1 The classification of attitudes in Anand & Hacquard (2013)

- (8) # Jean **a exigé** que Marie **doive** avoir connu son tueur.
 Jean **has demanded** that Marie **must.SUBJ** have known her killer
 ‘Jean demanded that Marie must have known her killer.’

The third class subsumes attitudes that are both representational and preference-based. This class includes emotive doxastics (e.g., ‘*hope*’, ‘*fear*’), and dubitatives (e.g., ‘*doubt*’, ‘*suspect*’). Anand and Hacquard suggest that this class tends to show cross-linguistic variation in mood selection due to its hybrid status. Importantly, they observe that attitudes of this class only allow possibility epistemic modals. This is illustrated by French *fear* in (9) (= Anand & Hacquard 2013: 18).

- (9) Jean **craint** que Marie {**puisse** / #**doive**} avoir connu son tueur.
 Jean **fears** that Marie **can.SUBJ must.SUBJ** have known her killer
 ‘Jean fears that Marie may have known her killer.’

Anand and Hacquard’s classification is summarized in Table 1. The fact that emotive doxastics and dubitatives only allow possibility epistemic modals will be important when we formulate the semantics of ka_{MFQ} in Section 3.

2.2 ka_{MFQ} appears in emotives and dubitatives

Although Japanese does not have a mood system like in Romance languages, complementizers reflect the divisions seen above to some extent. Japanese has a relatively rich inventory of complementizers (Kuno 1973; Nakau 1973; McCawley 1978; Uchi-bori 2000; Saito 2012, 2015; Yamada & Kubota 2018; Yamada 2019; a.o.), but here we focus on ‘*to*’ and ‘*yoo*’ for the sake of argument. As the following show, the two complementizers reflect the representational/non-representational cut very clearly. (10) and (11) show that *to* is only compatible with representational attitudes (i.e., attitudes of acceptance, emotive doxastics and dubitatives). (12) shows that *yoo* is only compatible with non-representational attitudes (i.e., directives and desideratives).

- (10) Jo-wa [Bo-ga kuru {to / *yoo}] **sinziteiru** / **hookokusita**.
 Jo-TOP Bo-NOM come C **believe** **reported**
 ‘Jo {believes / reported} that Bo will/would come.’

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- (11) Jo-wa [Bo-ga kuru {to / *yoo}] **kitaisiteiru** / **utagatteiru**.
 Jo-TOP Bo-NOM come C **hope** **suspect**
 ‘Jo {hopes / suspects} that Bo will come.’
- (12) Jo-wa [Bo-ga kuru {*to / yoo}] **negatteiru** / **yooseesita**.
 Jo-TOP Bo-NOM come C **wish** **demanded**
 ‘Jo {wishes / demanded} that Bo (would) come’

Now observe that, among the three classes within Anand and Hacquard’s classification, the Q-particle *ka* can only appear under emotive doxastics and dubitatives. (13) shows that *ka* cannot appear under attitudes of acceptance. (15) shows that *ka* is incompatible with *yoo*, which is selected by directives and desideratives.

- (13) * Jo-wa [Bo-ga kuru **ka** to] **sinziteiru** / **hookokusita**.
 Jo-TOP Bo-NOM come Q C **believe** **reported**
 (lit.) ‘Jo {believes / reported} that IF Bo will/would come.’
- (14) Jo-wa [Bo-ga kuru **ka** to] **kitaisiteiru** / **utagatteiru**.
 Jo-TOP Bo-NOM come Q C **hope** **suspect**
 (lit.) ‘Jo {hopes / suspects} that IF Bo will come.’
- (15) * Jo-wa [Bo-ga kuru **ka** yoo] **negatteiru** / **yooseesita**.
 Jo-TOP Bo-NOM come Q C **wish** **demanded**
 ‘Jo {wishes / demanded} that IF Bo (would) come’

The class of predicates that can license *ka* in embedded declaratives is in fact somewhat larger. As (16) and (17) show, *ka* may also appear under ‘*be excited*’ or ‘*regret*’, predicates that are generally classified as ‘emotive factives’.

- (16) a. Jo-wa [zibun-ga erabareta to] **wakuwakusiteiru**.
 Jo-TOP self-NOM was.elected C **is.excited**
 ‘Jo is excited that she was elected.’
- b. Jo-wa [zibun-ga erabareta **ka** to] **wakuwakusiteiru**.
 Jo-TOP self-NOM was.elected Q C **is.excited**
 (lit.) ‘Jo is excited that IF she was elected.’
- (17) a. Jo-wa [zibun-ga hayaku ki-sugi-ta to] **kookaisiteiru**.
 Jo-TOP self-NOM early come-EXCS-PAST C **regret**
 ‘Jo regrets that she came too early.’
- b. Jo-wa [zibun-ga hayaku ki-sugi-ta **ka** to] **kookaisiteiru**.
 Jo-TOP self-NOM early come-EXCS-PAST Q C **regret**
 (lit.) ‘Jo regrets that IF she came too early.’

Here let me clarify the status of ‘emotive factives’ in Japanese so as to forestall potential confusions. The term ‘emotive factive’ is somewhat misleading in Japanese, as factivity may not be triggered by an attitude predicate alone in this language. In general, emotive factives are analyzed as having the presupposition that the proposition denoted by the embedded sentence is true in the actual world. Due to this, when the context entails the negation of the complement of an emotive factive, the sentence gives rise to a feel of contradiction, as illustrated by English (18).

(18) # Jo was not elected, but she is excited that she was elected.

In Japanese, the presence of a factive presupposition is determined by the interplay between the choice of a complementizer and the choice of an attitude predicate (Kuno 1973; McCawley 1978; a.o.). Notably, *to* is usually assumed to *not* trigger a factive presupposition: in the case of *be excited* and *regret*, factivity is triggered by another complementizer ‘*koto*’ (lit. ‘thing’).³ The difference between the two complementizers with respect to the existence of a factive presupposition is shown in (19) and (20): in both cases only *koto* gives rise to a feel of contradiction.

(19) Jo-wa zissainiwa erabarenakatta. Sikasi kanozyo-wa [zibun-ga erabareta
Jo-TOP actually was.not.elected but she-TOP self-NOM is.elected
{to / #koto-ni}] **wakuwakusiteiru.**
C KOTO-DAT **is.excited**

(lit.) ‘Jo was actually not elected. But she is excited that she was elected.’

(20) Jo-wa zissainiwa zikandoorini tuita. Sikasi kanozyo-wa [zibun-ga
Jo-TOP actually on.time arrived but she-TOP self-NOM
hayaku ki-sugi-ta {to / #koto-o}] **kookaisiteiru.**
early come-EXCS-PAST C KOTO-DAT **regret**

(lit.) ‘Jo actually arrived on time. But she regrets that she came too early.’

Given that emotive doxastics do not trigger a factive presupposition, emotive doxastics and what we call ‘emotive factives’ are fundamentally the same kinds of attitudes

³ Note that so-called ‘cognitive factives’ behave somewhat differently with respect to the compatibility with the complementizers mentioned here: as (i) and (ii) show, these predicates strongly prefer (or even require) the use of *koto*. See the references cited above for further relevant observations.

(i) Jo-wa [Bo-ga erabareta {[?]/_{??}to / koto-o}] **sitteiru.**
Jo-TOP Bo-NOM was.elected C KOTO-ACC **know**
‘Jo knows that Bo was elected.’

(ii) Jo-wa [Bo-ga erabareta {*to / koto-o}] **oboeteiru.**
Jo-TOP Bo-NOM was.elected C KOTO-ACC **remember**
‘Jo remembers that Bo was elected.’

in Japanese, as long as *to* is used as the complementizer. That the two classes can be unified under *to* is supported by the fact that the use of *to* is obligatory to license ka_{MFQ} . (21) shows that *koto* is incompatible with *ka* (compare this with (16)).

- (21) * Jo-wa [zibun-ga erabareta **ka** koto-ni] **wakuwakusiteiru**.
 Jo-TOP self-NOM was.elected Q KOTO-DAT **is.excited**
 (lit.) ‘Jo is excited that IF she was elected.’

I henceforth use ‘emotives’ as a collective term for emotive doxastics and predicates like *be excited* or *regret*. Our conclusion is thus that ka_{MFQ} can only appear under emotives and dubitatives, as long as *to* is used as the complementizer.

2.3 Distinguishing ka_{MFQ} from apparently similar cases

Here let me clarify how ka_{MFQ} is distinguished from other apparently similar cases of *ka* observed in the literature. Saito (2012, 2015) discusses ‘*ka to*’ alignments that appear under predicates of communication like ‘*ask*’, as shown in (22).

- (22) Jo-wa [Bo-ga erabareru **ka to**] **tazuneta**.
 Jo-TOP Bo-NOM is.elected Q C **asked**
 (lit.) ‘Jo asked that whether Bo would be elected’

Couched in the Cartographic framework (see, e.g., Cinque & Rizzi 2010), Saito treats *ka* and *to* appearing under these predicates as a FORCE head and a REPORT head respectively, arguing that they conspire to form a ‘paraphrase of a direct question’. Saito’s analysis draws an analogy to the behavior of the Spanish complementizer ‘*que*’. It has been observed that, under predicates of communication like *ask*, Spanish *que* may appear immediately above an interrogative clause (Rivero 1978; Plann 1982; Suárez 1993; Lahiri 2002; a.o.). This is illustrated in (23).

- (23) Ellos **preguntan** [**que** [si se puede curar el SIDA]].
 they **ask** QUE whether CL can be.cured the AIDS
 ‘(lit.) They ask that whether AIDS can be cured.’

Lahiri (2002) argues that *que* in (23) is a ‘quotative marker’ that takes an interrogative clause as the object of a speech act. Saito’s analysis for Japanese *ask* basically follows the same line, assuming that *ka* is the head of an interrogative clause and *to* reports the interrogative clause as the object of a questioning speech act.

While this analysis may work for predicates like *ask*, I argue that it cannot be extended to the predicates we have been concerned with, namely emotives and dubitatives. Firstly, the ‘*que* + interrogative clause’ combination cannot be used for emotives and dubitatives in Spanish, as shown in (24).⁴

⁴ I thank Gabriel Martínez Vera for the judgment of these Spanish sentences.

- (24) * Ellos **esperan / dudan de [que [si se puede curar el SIDA]]**.
 they **hope doubt** C whether CL can be.cured the AIDS
 ‘(lit.) They {hope / doubt} that whether AIDS can be cured.’

Secondly, if *ka* is a FORCE head and it forms an interrogative clause, we predict that *wh*-interrogatives can similarly be headed by *to* under *hope* or *suspect*. However, this is not the case. Observe the contrast between (25) and (26).

- (25) Jo-wa [**dare-ga erabareru ka to**] **tazuneta**.
 Jo-TOP who-NOM is.elected Q C **ask**
 (lit.) ‘Jo asked that who would be elected.’
- (26) * Jo-wa [**dare-ga erabareru ka to**] **kitaisiteiru / utagatteiru**.
 Jo-TOP who-NOM is.elected Q C **hope suspect**
 (lit.) ‘Jo {hopes / suspects} that who will be elected.’

Thirdly, when there is an in-situ *wh*-phrase in the embedded clause, it is much more difficult for the *wh*-phrase to take matrix scope under *ask* than under *hope* or *suspect*. This is shown by the contrast between (27) and (28). This suggests that only in the former does *ka* constitute a *wh*-island equivalent to ‘*whether*’ and prevent the in-situ *wh*-phrase from taking matrix scope.⁵

- (27) ?? Jo-wa [**dare-ga erabareru ka to**] **tazuneta** no?
 Jo-TOP who-NOM is.elected Q C **asked** FIN
 (lit.) ‘Who_i did Jo ask that whether *t_i* would be elected?’
- (28) Jo-wa [**dare-ga erabareru ka to**] **kitaisiteiru / utagatteiru** no?
 Jo-TOP who-NOM is.elected Q C **hope suspect** FIN
 (lit.) ‘Who_i does Jo {hope / suspect} that IF *t_i* will be elected?’

These data confirm that Q-particles appearing under emotives and dubitatives should be distinguished from those appearing under predicates of communication like *ask*.⁶ In the next section, I will present the main proposal of this paper.

⁵ Note that the matrix polar question reading (lit. ‘*Did Jo ask that who would be elected?*’) is available for (27). Note also that there is no such matrix polar question reading available for *hope* or *suspect*: the only possible construal for (28) is the matrix *wh*-question reading mentioned in the main text.

⁶ The argument here has consequences for the treatment of the predicate ‘*omou*’, which is generally translated as ‘*think*’ and is known to allow *ka* to occur in its embedded clause. Interestingly, the presence of *ka* is most natural when the thinking event takes place in the past. Also observe that ‘*sinziteiru* (*believe*)’, which seems to have similar semantics, cannot license *ka* even if it is Past-tensed.

- (i) Jo-wa [zibun-ga erabareru ka to]^{2/??} **omotteiru / omotteita** / ***sinziteita**.
 Jo-TOP self-NOM is.elected Q C **think was.thinking was.believing**
 (lit.) ‘Jo {thinks / was thinking / was believing} that IF she will/would be elected.’

3 Proposal

3.1 The uncertainty presupposition

Recall from Section 2.1 that emotive doxastics and dubitatives only allow possibility epistemic modals. Anand and Hacquard argue that this is because they involve the so-called ‘uncertainty presupposition’, whose idea is roughly as follows:

- (29) The attitude holder’s doxastic state entails neither ϕ nor $\neg\phi$ (where ϕ is the embedded sentence).

Anand and Hacquard assume that (29) is encoded as part of the lexical semantics of emotive doxastics and dubitatives, at least in English and the Romance languages they investigated. I argue that, in Japanese, this presupposition is transparently encoded by ka_{MFQ} as its semantic contribution. That is, I propose that ka_{MFQ} is a morphological exponent of the uncertainty presupposition in (29).

I illustrate this with the predicate ‘*be excited*’ here. In (30), whether her university was elected or not is already settled in the doxastic state of Jo, the attitude holder. Since Jo’s doxastic state entails the positive answer here, the presence of *ka* should lead to infelicity. (30a) shows that it does. In contrast, no infelicity results in the same context if *ka* is omitted, as shown in (30b).

- (30) **Certain:** Jo had wanted to hold the conference at her university. She gets notified that her university has been elected as the venue for next year.

While *omou* was grouped into the same class of predicates as *ask* in Saito (2012, 2015), the behavior of this predicate in fact parallels that of emotives and dubitatives. (ii) shows that *ka* in an embedded clause cannot license an in-situ *wh*-phrase with *omou*, hence leading to ungrammaticality. (iii) shows that an in-situ *wh*-phrase can take matrix scope, implying that *ka* here does not count as a *wh*-island.

- (ii) * Jo-wa [**dare-ga** erabareru **ka** to] **omotteita**.
 Jo-TOP who-NOM is.elected Q C **was.thinking**
 (lit.) ‘Jo was thinking that who will be elected.’
- (iii) Jo-wa [**dare-ga** erabareru **ka** to] **omotteita** no?
 Jo-TOP who-NOM is.elected Q C **was.thinking** FIN
 (lit.) ‘Who_i was Jo thinking that IF t_i would be elected?’

Why does *omou* parallel emotives and dubitatives rather than attitudes of acceptance? As a reviewer points out, it could be that *omou* has a somewhat weaker force than other similar predicates like ‘*sinziru* (believe)’ and it may help avoid going counter to the semantics of ka_{MFQ} . Also, as Yasu Sudo (p.c.) points out, the fact that the use of *ka* is mostly restricted to past thinking events suggests that *omou* involves some sort of preferential meaning in the relevant cases, because expressing past thoughts tends to implicate that the attitude holder expected a situation different from what has actually happened (of course, to fully flesh out this claim, we would need to consider how the tense affects the semantics of attitude predicates). Further elaboration of these points is left for future work.

- a. # Jo-wa [zibun-no daigaku-ga erabareta **ka** to] **wakuwakusiteiru**.
 Jo-TOP self-GEN univ.-NOM was.elected Q C **is.excited**
 (lit.) ‘Jo is excited that IF her university was elected.’
- b. Jo-wa [zibun-no daigaku-ga erabareta to] **wakuwakusiteiru**.
 Jo-TOP self-GEN univ.-NOM was.elected C **is.excited**
 ‘Jo is excited that her university was elected.’

Next consider (31). Here the context specifies that whether her university was elected is still uncertain in Jo’s doxastic state. As we predict, the presence of *ka* does not lead to infelicity, since Jo’s doxastic state entails neither the positive nor the negative answer. Importantly, the absence of *ka* leads to infelicity here. The reason for this will be explicated in the next section.

- (31) **Uncertain:** Jo had wanted to host the conference at her university. The raffle for the venue has taken place, but Jo doesn’t know the result yet.
- a. Jo-wa [zibun-no daigaku-ga erabareta **ka** to] **wakuwakusiteiru**.
 Jo-TOP self-GEN univ.-NOM was.elected Q C **is.excited**
 (lit.) ‘Jo is excited that IF her university was elected.’
- b. # Jo-wa [zibun-no daigaku-ga erabareta to] **wakuwakusiteiru**.
 Jo-TOP self-GEN univ.-NOM was.elected C **is.excited**
 ‘Jo is excited that her university was elected.’

Furthermore, (32) confirms that the uncertainty inference triggered by *ka* is a presupposition. As (32a) shows, the uncertainty inference projects under negation and clashes with the global context, which specifies that Jo is certain that her university was elected as the venue. Compare this with the felicity of (32b), in which the uncertainty inference is absent due to the lack of *ka*.

- (32) **Context:** Jo hates to host a conference. Much to her dismay, she has been notified that her university has been elected as the venue for a major conference next year. She is not excited at all.
- a. ?? Jo-wa [zibun-no daigaku-ga erabareta **ka** to] **wakuwaksite-wa-inai**.
 Jo-TOP self-GEN univ.-NOM elected Q C **is.excited-TOP-NEG**
 (lit.) ‘It’s not true that Jo is excited that IF her university was elected.’
- b. Jo-wa [zibun-no daigaku-ga erabareta to] **wakuwaksite-wa-inai**.
 Jo-TOP self-GEN univ.-NOM was.elected C **is.excited-TOP-NEG**
 ‘It’s not true that Jo is excited that her university was elected.’

It is thus confirmed that ka_{MFQ} encodes an uncertainty presupposition as its semantic contribution. The idea will be formally implemented in the next section.

3.2 Formal analysis

I propose that ka_{MFQ} is syntactically a Mood head which projects immediately below the complementizer *to*. I assume that ka_{MFQ} combines with a TP, which I analyze as denoting a proposition (i.e., a set of possible worlds). I thus propose the structure in (33) for relevant sentences. ‘*Att*’ stands for attitude predicates; ‘ ϕ ’ stands for TPs.

$$(33) \quad \left[\text{VP} \left[\text{CP} \left[\text{MoodP } \phi \ ka_{\text{MFQ}} \right] \text{to} \right] \text{Att} \right]$$

I assume that no MoodP is projected when ka_{MFQ} is absent, and in that case the TP is directly combined with the complementizer. This is illustrated in (34).

$$(34) \quad \left[\text{VP} \left[\text{CP } \phi \ \text{to} \right] \text{Att} \right]$$

Like Anand & Hacquard (2013), I assume that the evaluation of a sentence is relativized to an information state parameter S in addition to a world parameter w , with information states defined as sets of possible worlds. Recall that representational attitudes describe the content of a propositionally consistent attitudinal state. Anand and Hacquard capture this by assuming that representational attitudes provide their own information states which are distinct from the one given as a parameter. For instance, *believe* provides the doxastic state of the attitude holder as its information state, whereas *dream* introduces the content of the dream that the attitude holder has had. For emotive doxastics and dubitatives, Anand and Hacquard assume that they make use of the doxastic state of the attitude holder as their information state. I extend this assumption to predicates like *be excited* and *regret* here.

Here I focus on the formulation of the presuppositional content. A comprehensive account of emotives and dubitatives would need to encompass their assertive content (e.g., preference or likelihood) too, but I will ignore it here for ease of exposition. Relevant issues will be addressed in Section 4, where I will discuss how the current framework would have to be modified to incorporate the preferential component.

As argued in Section 3.1, ka_{MFQ} is analyzed as encoding an uncertainty presupposition, which requires that the information state provided by the attitude predicate entail neither ϕ nor $\neg\phi$. This presupposition is formulated as the requirement that the information state include at least one ϕ -world and at least one $\neg\phi$ -world. This is illustrated in (35). Here ‘ S_{Att} ’ is meant as the information state provided by *Att* (e.g., in the case of *believe*, S_{Att} is identified with Dox_w^x). ‘ \dots ’ in the formula will be replaced by the assertive content of each predicate.

$$(35) \quad \left[\left[\text{VP} \left[\text{CP} \left[\text{MoodP } \phi \ ka_{\text{MFQ}} \right] \text{to} \right] \text{Att} \right] \right]^{w,S} \\ = \lambda x: \underbrace{\exists w' \in S_{\text{Att}}. \llbracket \phi \rrbracket^{w',S_{\text{Att}}} \wedge \exists w'' \in S_{\text{Att}}. \llbracket \neg\phi \rrbracket^{w'',S_{\text{Att}}} \dots}_{\text{Uncertainty Presupposition}}$$

When ka_{MFQ} is absent, the sentence encodes no presupposition (assuming that there are no other presuppositions projecting from below), as shown in (36).

$$(36) \quad \llbracket [\text{VP} [\text{CP } \phi \text{ to }] \text{Att}] \rrbracket^{w,S} = \lambda x: \underbrace{\quad \quad \quad}_{\text{No Presupposition}} \cdot \dots$$

The semantics proposed in (35) and (36) derive the contrasts observed in Section 3.1. First consider **Certain**, the context in (30), which specifies that Jo knows that her university was elected as the venue. As we assume, the predicate *be excited* provides the doxastic state of the attitude holder as its information state. Since Jo is fully certain, it is true at every world in her doxastic state that her university was elected as the venue. This status of the doxastic state clashes with the uncertainty presupposition of ka_{MFQ} , which requires that the doxastic state include at least one world at which Jo’s university was not elected as the venue, hence infelicity. The sentence without ka_{MFQ} is unproblematic here, since it comes with no presupposition.

Next consider **Uncertain**, the context in (31), which specifies that whether her university was elected as the venue is uncertain in Jo’s doxastic state. Here the presence of ka_{MFQ} is unproblematic, since the doxastic state here includes both worlds where her university was elected and worlds where it wasn’t. Now why does the sentence without ka_{MFQ} , which involves no presupposition and thus seems innocuous in this context, end up being infelicitous here? I argue that this is because it competes with the sentence with ka_{MFQ} in terms of presuppositional strength.⁷ Specifically, the sentence with ka_{MFQ} has a stronger presupposition than the sentence without ka_{MFQ} , and since the use of the former is felicitous in the present context, the use of the latter is prohibited by *Maximize Presupposition!* (Heim 1991), which requires that the speaker use the felicitous sentence with the strongest presupposition among alternatives.⁸ The use of the sentence without ka_{MFQ} thus violates *Maximize Presupposition!*, hence the infelicity of the sentence.

⁷ I thank Wataru Uegaki for suggesting this line of analysis.

⁸ When the context is compatible with the stronger presupposition, the use of the sentence with the weaker presupposition triggers the ‘anti-presupposition’, the inference that the stronger presupposition is false (Percus 2006; Sauerland 2008; Schlenker 2012; a.o.). In the current case, using the sentence without ka_{MFQ} while the context is compatible with the presupposition of ka_{MFQ} gives rise to the inference that $\neg(\exists w' \in S_{\text{Att}}. \llbracket \phi \rrbracket^{w',S_{\text{Att}}} \wedge \exists w'' \in S_{\text{Att}}. \llbracket \neg\phi \rrbracket^{w'',S_{\text{Att}}})$. However, the inference we would obtain is in fact stronger than this; it is inferred from the use of the sentence without ka_{MFQ} that $\neg\exists w'' \in S_{\text{Att}}. \llbracket \neg\phi \rrbracket^{w'',S_{\text{Att}}}$, the negation of the right conjunct of the uncertainty presupposition. This stronger inference is derived if emotives and dubitatives are assumed to require (as an assertive content) that $\exists w' \in S_{\text{Att}}. \llbracket \phi \rrbracket^{w',S_{\text{Att}}}$. Indeed, as has been suggested in the literature, predicates like *hope* require the attitude holder to believe the possibility of the embedded sentence (Portner 1992; Scheffler 2008; Anand & Hacquard 2013; a.o.). It would thus be more precise to say that the infelicity of the sentence without ka_{MFQ} in **Uncertain** is derived from the conflict between the doxastic state that is still uncertain regarding the truth value of the proposition in question, and the anti-presupposition triggered by the non-use of ka_{MFQ} .

3.3 Explaining the incompatibility with ka_{MFQ}

We observed in Section 2.2 that some predicates are incompatible with the presence of ka_{MFQ} . Why is ka_{MFQ} not licensed under these predicates? Recall first that attitudes of acceptance are incompatible with ka_{MFQ} . The relevant example is repeated in (37).

- (37) * Jo-wa [Bo-ga kuru **ka to**] **sinziteiru** / **hookokusita**.
 Jo-TOP Bo-NOM come Q C **believe** **reported**
 (lit.) ‘Jo {believes / reported} that IF Bo will/would come.’

I suggest that the reason why attitudes of acceptance are incompatible with ka_{MFQ} is because they normally involve universal quantification over an information state, which necessarily contradicts the uncertainty presupposition of ka_{MFQ} . Recall that attitudes of acceptance are representational, thus they provide their own information states as quantification domains. If one believes ϕ , ϕ is true in every world in one’s doxastic state. If one reports ϕ , ϕ is true in every world in the informational content generated by the relevant report. This universal quantification is unproblematic when ka_{MFQ} is absent since there will be no presupposition then, as shown in (38).

$$(38) \quad \llbracket \llbracket \text{VP [CP } \phi \text{ to] Att.Acc} \rrbracket \rrbracket^{w,S} = \lambda x: \underbrace{\phantom{\forall w' \in S_{Att}. \llbracket \phi \rrbracket^{w', S_{Att}}}}_{\text{No Presup.}} \cdot \underbrace{\forall w' \in S_{Att}. \llbracket \phi \rrbracket^{w', S_{Att}}}_{\text{Assertive Content}}$$

However, when ka_{MFQ} is present, their assertive content necessarily contradicts the right conjunct of the uncertainty presupposition: while the former requires that ϕ be true at every world in S_{Att} , the latter requires that $\neg\phi$ be true at some world in S_{Att} . This explains the incompatibility between attitudes of acceptance and ka_{MFQ} .

$$(39) \quad \llbracket \llbracket \llbracket \llbracket \text{MoodP } \phi \text{ } ka_{MFQ} \rrbracket \text{ to} \rrbracket \text{ Att.Acc} \rrbracket \rrbracket^{w,S} \\
 = \lambda x: \underbrace{\exists w' \in S_{Att}. \llbracket \phi \rrbracket^{w', S_{Att}} \wedge \exists w'' \in S_{Att}. \llbracket \neg\phi \rrbracket^{w'', S_{Att}}}_{\text{Presupposition}} \cdot \underbrace{\forall w''' \in S_{Att}. \llbracket \phi \rrbracket^{w''', S_{Att}}}_{\text{Assertive Content}}$$

We also observed that desideratives and directives are incompatible with ka_{MFQ} . The relevant example is repeated in (40). Recall that these attitudes select for the complementizer *yoo*, and this complementizer is simply incompatible with ka_{MFQ} .

- (40) * Jo-wa [Bo-ga kuru **ka yoo**] **negatteiru** / **yooseesita**.
 Jo-TOP Bo-NOM come Q C **wish** **demanded**
 (lit.) ‘Jo {wishes / demanded} that IF Bo (would) come’

Since desideratives and directives are non-representational attitudes, they do not provide consistent information states, in contrast to attitudes of acceptance or emotives/dubitatives. Anand & Hacquard (2013) capture this by assuming that non-representational attitudes provide the empty set as their information state. What

I suggest here is that the complementizer *yoo* encodes exactly this information, namely that the relevant information state is empty. Crucially, then, the presence of *yoo* necessarily renders ka_{MFQ} 's uncertainty presupposition false, as shown in (41): because the domain is empty, there are no worlds at which ϕ is true, nor ones at which $\neg\phi$ is true, hence both conjuncts are false. Using ka_{MFQ} and *yoo* together thus implies that the presupposition of the whole sentence can never be satisfied.

$$(41) \quad \begin{aligned} & \lll [\lll [\text{MoodP } \phi \text{ } ka_{\text{MFQ}}] \text{ } yoo] \text{ } Des/Dir \rrr \rrr]^{w,S} \\ & = \lambda x: \underbrace{\exists w' \in \emptyset. \lll \phi \rrr^{w',\emptyset} \wedge \exists w'' \in \emptyset. \lll \neg\phi \rrr^{w'',\emptyset}}_{\text{Presupposition}} \dots \end{aligned}$$

4 A puzzle: the licensing of embedded epistemic modals

This section discusses how the presence or absence of ka_{MFQ} affects the embedding of possibility and necessity epistemic modals. As will be shown, epistemic modals embedded under emotives and dubitatives exhibit effects in Japanese that are unexpected in light of what is known from English and Romance languages. Here I will concentrate on describing the puzzle, so that it can be thoroughly investigated in future research. I will first introduce the basic idea regarding embedded epistemic modals, then briefly explain how the uncertainty presupposition will be modified to deal with sentences involving embedded epistemic modals, and finally show how ka_{MFQ} interacts with embedded epistemic modals.

Recall from Section 2.1 that only representational attitudes can accommodate epistemic modals in the embedded clause. Anand & Hacquard (2013) argue that this is because only representational attitudes can provide a consistent information state which can be utilized by embedded epistemic modals, on the assumption that epistemic modals obtain their modal bases via anaphoric reference to information states (Veltman 1996; Yalcin 2007; Hacquard 2010; a.o.). This dependency on information states involved in epistemic modals is captured by assuming that their evaluation is solely sensitive to the information state parameter, as shown in (42).

$$(42) \quad \begin{aligned} \text{a.} \quad & \lll \textit{might } \phi \rrr^{w,S} = 1 \text{ iff } \exists w' \in S. \lll \phi \rrr^{w',S} \\ \text{b.} \quad & \lll \textit{must } \phi \rrr^{w,S} = 1 \text{ iff } \forall w' \in S. \lll \phi \rrr^{w',S} \end{aligned}$$

When an epistemic modal is embedded under a representational attitude, its quantification domain is identified with the information state provided by that attitude. The interpretation of the matrix VP in (43) (repeated from (6)) is illustrated in (44) and (45). As an attitude of acceptance, *believe* can embed both possibility and necessity modals (notice that in each case the outer quantification ends up being redundant).

$$(43) \quad \text{John believes that Paul } \{\textit{might} / \textit{must}\} \text{ have killed her.}$$

$$\begin{array}{ll}
 (44) \quad \llbracket \textit{believe might } \phi \rrbracket^{w,S} & (45) \quad \llbracket \textit{believe must } \phi \rrbracket^{w,S} \\
 = \lambda x. \forall w' \in S_{Att}. \llbracket \textit{might } \phi \rrbracket^{w',S_{Att}} & = \lambda x. \forall w' \in S_{Att}. \llbracket \textit{might } \phi \rrbracket^{w',S_{Att}} \\
 = \lambda x. \forall w' \in S_{Att}. \exists w'' \in S_{Att}. \llbracket \phi \rrbracket^{w'',S_{Att}} & = \lambda x. \forall w' \in S_{Att}. \forall w'' \in S_{Att}. \llbracket \phi \rrbracket^{w'',S_{Att}} \\
 = \lambda x. \exists w' \in S_{Att}. \llbracket \phi \rrbracket^{w',S_{Att}} & = \lambda x. \forall w' \in S_{Att}. \llbracket \phi \rrbracket^{w',S_{Att}} \\
 \text{(where } S_{Att} = Dox_w^x) & \text{(where } S_{Att} = Dox_w^x)
 \end{array}$$

Also recall that emotives and dubitatives can only embed possibility modals. The relevant French example is repeated in (46). Anand & Hacquard (2013) argue that necessity modals are disallowed due to the uncertainty presupposition involved in these predicates: although they provide an information state for epistemic modals, the semantics of necessity modals clashes with the requirement that the information state be uncertain about the truth or falsity of the embedded sentence.

- (46) Jean **craint** que Marie {**puisse** / #**doive**} avoir connu son tueur.
 Jean **fears** that Marie **can**.SUBJ **must**.SUBJ have known her killer
 ‘Jean fears that Marie may have known her killer.’

Now notice that the current framework must be modified to give a compositional account of sentences involving embedded epistemic modals like (46). Recall that emotives and dubitatives are preference-based attitudes, which means that they involve comparison among propositional alternatives. In (46), the embedded sentence is modalized, and from a compositional standpoint, it would be this modalized sentence and its negation that are to be compared. However, as the evaluation of modals is not world-sensitive in the current setting, the proposition ‘ $\lambda w. \exists w' \in S. \llbracket \phi \rrbracket^{w',S}$ ’ is uniformly true or false throughout S depending on whether there is a ϕ -world in S , and so is its negative counterpart ‘ $\lambda w. \neg \exists w' \in S. \llbracket \phi \rrbracket^{w',S}$ ’. Comparing these two propositions would thus be comparing a necessary truth and a necessary falsehood relative to S , making no meaningful claim about one’s preference or likelihood.

To avoid this problem, Anand & Hacquard (2013) formalize the preferential meaning as comparison among ‘sets of information states’, introducing the notion of ‘verifiers’ and ‘falsifiers’. Roughly, ϕ -verifiers/falsifiers in an information state S are subsets of S relative to which ϕ is persistently true/false.⁹ Anand and Hacquard re-define the preferential meaning of preference-based attitudes as comparison between ϕ -verifiers and ϕ -falsifiers, which is assumed to represent how the attitude holder wants her uncertainty ‘ ϕ or $\neg\phi$ ’ to be settled. This information-state-based definition of preference allows us to compare modalized sentences in a similar fashion: that is,

⁹ Formally, the set of ϕ -verifiers in S is the set of sub-states $S' \subseteq S$ such that for any $S'' \subseteq S'$, ϕ is true in every $w \in S''$ (ϕ -falsifiers are defined as $\neg\phi$ -verifiers; see Anand & Hacquard 2013 for more detailed elaboration of these notions). Note that S' and S'' here would have to be restricted to non-empty sets; otherwise a state that falsifies ϕ would contain a ϕ -verifier (i.e., the empty set), and vice versa.

in (46), one compares subsets of Jean's doxastic state that verify *'Marie may have known her killer'* against subsets of Jean's doxastic state that falsify it.

Anand and Hacquard reformulate the uncertainty presupposition based on verifiers and falsifiers: e.g., *'hope ϕ '* is analyzed as presupposing that there be some ϕ -verifier and some ϕ -falsifier in one's doxastic state. Now consider *'hope must ϕ '*. Since *'must ϕ '* requires that every world in the doxastic state be a ϕ -world, it contradicts the requirement that there be a *'must ϕ '*-falsifier in the doxastic state. In contrast, *'hope might ϕ '* does not lead to contradiction: *'might ϕ '* requires that there be some ϕ -world in the doxastic state, and this does not clash with the presence of a *'might ϕ '*-falsifier in the same doxastic state. The refined semantics thus correctly captures the fact regarding the embedding of possibility and necessity modals under emotives and dubitatives, at least for English and Romance languages.

With this in mind, let us turn to Japanese. First consider necessity modals. (47a) shows that predicates can embed a necessity modal when ka_{MFQ} is absent. This is not surprising: since ka_{MFQ} is absent, it is not required that there be some *'must ϕ '*-falsifier in the doxastic state, hence no clash with the necessity modal. (47b) shows that predicates cannot embed a necessity modal when ka_{MFQ} is present. This is not surprising either: the requirement that there be some *'must ϕ '*-falsifier conflicts with the semantics of the necessity modal, hence the unacceptability of the sentence.

- (47) a. Jo-wa [Bo-ga katta **nitigainai** to] **kitaisiteiru** / **utagatteiru**.
 Jo-TOP Bo-NOM won **must** C **hope** **suspect**
 (lit.) 'Jo {hopes / suspects} that Bo must have won.'
- b. * Jo-wa [Bo-ga katta **nitigainai ka** to] **kitaisiteiru** / **utagatteiru**.
 Jo-TOP Bo-NOM won **must** Q C **hope** **suspect**
 (lit.) 'Jo {hopes / suspects} that IF Bo must have won.'

Now here is the puzzle. As shown in (48), possibility modals can be embedded when ka_{MFQ} is absent, and crucially, they cannot be embedded when ka_{MFQ} is present.

- (48) a. Jo-wa [Bo-ga katta **kamosirenai** to] **kitaisiteiru** / **utagatteiru**.
 Jo-TOP Bo-NOM won **might** C **hope** **suspect**
 (lit.) 'Jo {hopes / suspects} that Bo might have won.'
- b. * Jo-wa [Bo-ga katta **kamosirenai ka** to] **kitaisiteiru** / **utagatteiru**.
 Jo-TOP Bo-NOM won **might** Q C **hope** **suspect**
 (lit.) 'Jo {hopes / suspects} that IF Bo might have won.'

The badness of (48b) is surprising. Given the semantics introduced just above, (48b) would be analyzed as at least requiring that there be some *'might ϕ '*-falsifier in the doxastic state (due to the uncertainty presupposition of ka_{MFQ}), and there is

some ϕ -world in the doxastic state (i.e., the semantics of ‘*might ϕ* ’), but the two requirements do not contradict. Japanese thus seems to differ from English and Romance languages. As seen in (46), French *fear* can embed a possibility modal. As shown in (49), English *hope* can similarly embed a possibility modal.

(49) John hopes that it might be raining.

Why is Japanese (48b) unacceptable in contrast to French (46) and English (49)? One possibility that I can think of is that the possibility modal in (48) is actually located in the Mood projection, functioning as a ‘mood-indicating’ modal (e.g., Portner 1997) and encoding the same presupposition as ka_{MFQ} does. The presence of this modal and ka_{MFQ} in one sentence would lead to clash, as they would occupy the same syntactic position. The reason why possibility modals can be embedded under relevant predicates in English and Romance languages could be because these languages do not have such syntactic competition among more than one element. In fact, this dividing line separating Japanese from English or French correlates with the presence or absence of a morpheme that transparently encodes the uncertainty presupposition. Japanese has such a morpheme (i.e., ka_{MFQ}), which appears within the embedded clause and thus could syntactically compete with the possibility modal in the same clause. English and French encode the uncertainty presupposition opaquely within the semantics of emotives and dubitatives, which may preempt a potential competition with a modal in the embedded clause.

The account here is still vague, and there may be other possible accounts that could explain the discrepancy between Japanese and English and Romance languages. I must leave further investigation for another occasion.

5 Conclusion

I conclude this paper with remarks on three areas on which the proposed account has interesting implications. The first is the semantics of mood, especially that of subjunctive mood. As noted in Section 2, the Romance subjunctive is typically selected by preference-based attitudes, with desideratives and directives being core cases. Although there is overlap in terms of distribution, ka_{MFQ} cannot be simply equated to the Romance subjunctive, as the former is licensed by a smaller class of attitudes than the latter generally is (recall that the core subjunctive cases are covered by a distinct complementizer, i.e., *yoo*). That said, I point out that ka_{MFQ} in fact shares some traits with subjunctive mood, at least in some non-Romance languages. Smirnova (2014) argues that the choice of indicative or subjunctive in Bulgarian depends on how strongly the attitude holder is committed to the proposition denoted by the embedded sentence. In particular, she argues that the Bulgarian subjunctive encodes the ‘domain heterogeneity’ of the information state, which exactly resembles

the semantic contribution of ka_{MFQ} proposed in this paper. The function of ka_{MFQ} is thus probably not a language-specific quirk, but rather instantiates a more general semantic concept, which could be encoded in different languages in different ways. ka_{MFQ} thus adds an interesting twist to the linguistic variation of mood encoding.

The second is the licensing of so-called ‘expletive negation’, the phenomenon in which the negation marker loses its truth-conditional meaning (Portner & Zanuttini 2000; Abels 2005; Yoon 2011, 2013; a.o.). Yoon (2011, 2013) observes that expletive negation (which she calls ‘evaluative negation’) is licensed under predicates like *hope* or *fear* in Japanese and Korean. As shown in (50), the negative marker ‘*nai*’ loses its logical meaning, as is evident from the fact that the sentence implies that Jo wanted Bo to come, as if there were no negation involved.

- (50) Jo-wa [Bo-ga ko-**nai** ka to] **kitaisiteita**.
 Jo-TOP Bo-NOM come-NEG Q COMP **hoped**
 (lit.) ‘Jo was hoping that IF Bo wouldn’t come.’ \rightsquigarrow *Jo wanted Bo to come*

Yoon claims that the licensing of expletive negation correlates with the presence of what she calls a ‘non-factive’ complementizer, which she identifies with the ‘*ka to*’ complex for Japanese. While it is treated as a single unit in her gloss, we have already observed that it is decomposable into the complementizer *to* and the Mood head ka_{MFQ} . Furthermore, I point out that it is rather this Mood head that is crucial to the licensing of expletive negation. Consider (51). Once *ka* is omitted, the negative marker no longer constitutes expletive negation; the sentence only implies that Jo did not want Bo to come, with the negative marker having its ordinary meaning.

- (51) Jo-wa [Bo-ga ko-**nai** to] **kitaisiteita**.
 Jo-TOP Bo-NOM come-NEG COMP **hoped**
 (lit.) ‘Jo was hoping that Bo wouldn’t come.’ \rightsquigarrow *Jo did not want Bo to come*

This is in fact consistent with Yoon’s claim that expletive negation is licensed by ‘non-veridicality’ (Giannakidou 1998), a concept which is very similar to the idea of ‘uncertainty’ we have defined. While further research is needed, I suggest that ka_{MFQ} plays a pivotal role in the licensing of expletive negation.

The final issue is the semantics of Q-particles. Just as questions, disjunctives and indefinites presume the existence of more than one live alternative (Ciardelli, Groenendijk & Roelofsen 2018), ka_{MFQ} requires the agent’s doxastic state to be open to multiple possibilities for settling issues. The idea of uncertainty behind ka_{MFQ} thus shares the same semantic core as other occurrences of *ka* in (1)-(4). While it remains to be seen whether Q-particles in other languages have the same function as I have shown for Japanese *ka*, this study has contributed to our further understanding of this extensively studied functional item, highlighting its hitherto understudied aspect as an element that operates on the doxastic state of the attitude holder.

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